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Advertisements, occasioned by the Remarks printed in Numb. 114, upon Frosts in some parts of Scotland, differing in their Anniversary Seasons and Force from our ordinary Frosts in England: Of Black Winds and Tempests: Of the warm, or fertilizing Temperature and Steams of the surface of the Earth, Stones, Rocks, Springs, Waters, (some in some places, more than other in other places;) Of Petrifying and Metallizing Waters: With some hints for the Horti-culture of Scotland: By the Reverend and Learned Dr. J. Beal, F.R.S. ; who by way of Letter imparted them to the Publisher.

S I R,

IT may seem, by the curious Remarks sent to you from Scotland, that we are yet to seek out the Causes and original Source, as well as the Principles and Nature, of *Frosts*. I wish, I were able to name all circumstances that may be causative of Frosts, Heats, Winds, and Tempests. I know by experience, that the situation of the place is considerable for some of these; but, after much diligence and troublesome researches, I cannot define the proximity or distance, nor all the requisites, that ought to be concurrent for all the strange effects I have observ'd in them.

2. Honourable Mr. *Boyle*, according to his usual accurateness, hath given us an account of the antecedent, concomitant, and following changes of Air, and Weather, and very black Winds, when the Earthquake was about *Oxford*, *Januar.* 19. 1685; recited in *Numb. 11. p. 176. of your Tracts*. And 'tis described by Dr. *Wallis*, *Numb. 10. p. 168*, with the *weight* of the Air about the time. I conceive, the Subterraneous steams might be the cause of such a Midland Earthquake. And I know no surer or better way to find out the nature and properties of those Steams, than by observing the Effects, and all the Alterations of the Air, as they did.

3. Of the strange *Frost*, which was here about *Christmas* 1672, and the sudden blossoming and budding Heats which followed, I sent you the particulars, as they are in your *Numb. 90, from Somersetshire*, scribbling *raptim*, and concealing my Name, because I never heard of the like, (having often observ'd the Multitude, after their Nine daies wonder, and their own Fabulous exaggerations, to fall so far back as to deny the truth of what themselves saw and felt;) yet, since it was in the main substance confirmed from
Oxford

Oxford by Dr. *Wallis*, as it is recorded in your *Numb.* 92, and was also testified, in the body of it, by a Gentleman of the best credit and Judgment amongst us, whose hands and eyes were good Witnesses to what he wrote; I do now own it; and indeed with a desire, that our friendly Correspondents in *Scotland* may be pleased to compare it with some of the *phenomena* by them mentioned. For, though theirs be remarkable for frequency and anniversary constancy, this for extraordinary; yet this shews, that a *Frost* may be very fierce and dangerous in the Air, and on the tops of some Hills and Plains, whilst in many other places it keeps at two, three or four foot distance above the ground, Rivers, and Lakes; and may wander, at some difference of time, in some places very furious; in other places, intermediate and not far asunder, very remiss and abated; where it was fierce, alwaies at the height of Trees at least, never on the ground vehement, that I could hear of, but on *Salisbury Plains*, which are very high grounds. And further, if I were worthy, I would solicit it, that some Almanack-makers may be persuaded to record *changes* of Air, and *extraordinary* Winds and Weather, as is there directed: That we may have fewer false predictions, and more faithful Registers, both of the fore-running Signs, and of the following Events; which may be for sound and deep Philosophy, domestical and political uses, and indeed for many more uses, than I have there expressed. Doubtless, as Old Sea-men have their prognosticks of Storms at Sea, so may the like be had on Land, to prepare us to secure our Houses and Lives. By the observations, which I have often made of *coasting Tempests*, Lightning, and fatal Thunder-bolts (as we call them) as soon as I heard of the late Hurrican at *Utrecht* and *Amsterdam*, I did fear more mischief to follow in other places. So it hath fallen out often in my memory. I took special notice of those *Wandering Tempests* in *England*, of which Dr. *Tho. Jackson* gave a general account, published *An.* 1637: I noted the particular damages then done, and some terrible executions before, and several times since Dr. *Jacksons* account.

4. I have heard, that Mr. *Josbua Childray*, whose ingenious disquisitions you have published in several of your Volumes, made a Journal of the quantity of *Rain* that fell at any time where he abode, in *England*, these many years. And Mr. *Axe* lately told me, that he thinks, *his* Notes may be recovered, where he deceased.

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We may see, what hath been solicited, *Hist. R. S. p. 173.* If in some Almanacks in *England, Scotland, Ireland, New England*, and other remote parts of his Majesties Dominions, Registers were well begun of the most remarkable Prognosticks and Events, &c. this would put a just value upon such Almanacks, and much advance our knowledge in this Philosophical Age, in matters of great concernment, perhaps to fore-see *Dearth, Mortalities, &c.*

5. Also, to promote the Inquiries above, I must acknowledge my self the Scribler of the short Note beginning your Tract of *May* last, *N. 114*; and shall now proceed to enlarge a little upon the Instances there briefly toucht.

6. First, 'tis vulgarly known, that the surface of some ground is so hollow, light, and swoln by a hot and working ferment, that it must needs send up a warming steam; as appears by the quick rid-dance of all the Snow that falls on it, and (in many places within my knowledge) dissolving the Snow before it falls on the ground: *that* some Stones by an innate warmth, and some Waters do impregnate the Earth; and *that* other Stones by their contrary qualities, or by their positions, have a quite contrary operation; *that* streams of Water running over Lime-stones, or through veins of Marle, or of that sort of Chalk which is kind for manure (for there is a sort of Chalk which is barren) doth fertilize; *that* some other Waters are hungry, *uliginous* and *corrosive*; and *that* those Rivers which are filled with a Black water, by Rain running over Heaths, do much mischief where they over-flow, begetting Heath all over the Pastures. These are vulgarities; but I think them very pertinent, and worthy to be considered for our purposes. And there are many Petrifying waters, and Metallizing waters; as also Petrifying and Metallizing Steams. For the former, we cannot disbelieve the Ancients, since our Moderns have lately had a sad example of dispatching Petrefaction. And for Metallizing Steams, I refer to your *Numb. 27. p. 194.* where we are inform'd, that in *Italy* Quicksilver is found at the roots and in the juyce of a Plant; and that in *Moravia, Hungary, Peru*, and other parts, Mineral-juyces are found in Vegetables. Neither can I with confidence contradict the numerous Instances offered in *Miscell. curios. Lipsæ Annus primus 1670, Observ. 131. p. 290*, under the Title, *Aurum Vegetabile*; since I have heard good proofs, that all Mettals, and Gold it self, is continually generated, and we know nothing disenabled to emit its proper

proper Atmosphere; and since our Honourable Philosopher, Mr. Boyle, hath shewed us, that *Fire* and *Flame* (as perhaps the Solar beams) may be incorporated to increase the weight, and (as I take it) the bulk also of *Lead*, and other Mettals and Minerals, &c. See Mr. Boyles Experiments at the end of his *Effluvijs*, and *Hist. R. S.* p. 228; and since Gold it self is by mixture volatilized in your N. 87; and since our Old Philosophers do allow the Sun to give a potent assistance in the generation of all things that are generated. But may not Mines be discovered by examining the juyces of Vegetables growing on the place, and by the Waters which issue thence, as elsewhere I have proposed?

7. But to return to our *Vulgarities*, which may chance to have the richest usefulness or pertinence to our Inquiries. In the sharpest *Frost*, that I have known these many years, the ground having been also some daies cover'd with Snow, I saw a small stream (no bigger than might run from the mouth of an ordinary quart Bottle, as now we have them of green Glass,) sliding merrily, and smoaking all the way over the *lawns*: I could not discern, that any Snow had fallen within five or six foot on each side; if it did, none remained there, and so far the Grass at that time, about *Christmas*, was as green as any Leek, and the Frost (so far) apparently dissolved: *Of this I then wrote to our Worthy friend Mr. Evelyn, not for any wonder, (for perhaps there are or may be thousands of such smoaking Streams in England,) but only representing, How such a Stream may warm a mansion, and cherish tender evergreens well sheltered from winds, and flowry Gardens, all the hard Winter, and do us better service in an extreme hot Summer.* I have been perplext in observing my self, an hundred times, the difference of Heat and Cold between two Villages, within a mile of each other, where we could discern no disparity of Hills or Rivers; only the Springs in the one were all shallower, in the other some were deeper. In a large Tract of Land the surface was of so hot a ferment, that at every step I trod up to the ankles. I caused it to be examined by the Spade, and found it, as far as I tried here and there, at a foot depth, as thick set with Pibble-stones as if a Causey had been pitcht there; yet was it a quick and pregnant Land, for Flowers, Fruit-trees, and Vines, these Pibbles being dislodged, and some of them carried away. I have seen Fields where the surface did seem cover'd with Pibbles, not Flinty, nor Lime-stone, yet they bore full burthens of
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the best and cleaneſt rye and oats : The husbandmen took away the pebbles from off the ſurface ; and then the land bore as ſtrong wheat, peaſe and barley, as before it bore oats and rye. In other parts where I have been, the husbandmen took away the ſtones which ſeemed to cover the fields, and ſuſtain'd great loſs for their coſtly labour ; their corn was much weaker for ſome years after. I can attribute theſe differing events to nothing, but the difference of ſtones, ſome intrinſically warm, and impregnating above ground ; ſome cold and not impregnating, whileſt in that poſition, or ſituation. Yet ſome experience forbids me to deny, that even ſuch ſtones, when covered with earth, at a certain depth, may increaſe the fertility of the land. And the hot and bibulous land, which drinks up the rain and ſnow as ſoon as it falls, ſeems to have ſome cooling reſreſhment from under-ground pebbles, which are of a cold, ſtiff, and ſullen nature.

8. Sir, ſome years ago, I wrote to you from Sir *W. St.* mouth, that he could ſhew you, where water paſſeth very ſlowly over ſtone, and thence, drop by drop, falls down white, like curdled milk, and is afterwards there petrified. This doth ſeem to ſhew the manner of petrification. And this I take to be the ſlow and cooling operation of ſome kind of ſtones, more than of other.

9. What I have to ſay of warming and fertilizing *Rocks*, I ſhall deliver with an aſpect towards *Scotland*, for *Horticulture*. I had ſeveral times conference with Sir *Robert Morray* B.M. (who was an honour to his Countrey, and a bleſſing to the place where he abode) concerning eſculent and olitary gardens, and (under one) Nurſeries of Fruit-trees, and other uſeful Vegetables in *Scotland*. I reſented, *that*, almoſt within my memory, they are become the chief relief of *England* ; *that* 'tis lately found, that aſſere fruit yield the ſtrong and ſprightful liquor, which reſembles the Wine of the grape ; *that* the return of gain from Gardens is great and ſpeedy ; Nurſeries neither a chargeable nor a burthenſome addition, but a congruous engagement of the Multitudes to perſevere in the nobleſt kind of Agriculture. Sir *R.M.* granted all that I ſaid ; and I am ſure, he acted and executed all that he could for the good of his own Countrey, and for *England*, &c. But, ſaith he, there are ſo many *Rocks*, and ſuch bleak winds in *Scotland*, that they

can hardly draw in the same yoke with *England* for Gardens and Orchards. I replied, that in *Devon* and *Cornwall*, they fenced their Gardens and Orchards with *Flanders* furs and tall holly from the sea-winds, and they have lofty firs, and goodly Pines in *Scotland*; and *New England*, (where the winds are as keen, and the snow and frosts as deep, and as long lasting, as in many parts of *Scotland*,) is yet full of fruitful Orchards. And if *Scotland* be farther in the North, yet *Normy* is rich in Boscage; and the seeds of the Hemlock-tree, Spruce, and Cedars from *New England*, *New-found-land*, and *Virginia*, may perhaps rejoice in the exchange of *Northern America*, for the North of this Island. And *Scotland* may say, *Non tam aversus equos nostro Sol vertit ab Orbe*. The Sun affords them a longer Summers day in the remotest North, than at *Rome*. And 'tis a point of good Philosophy and good husbandry to find out, what vegetables are aptest to bake the better by that advantage. And *Scotland* hath no need to borrow Wit and Industry from their neighbours: Witness their Linnen trade, their Fishery, their Mines, their Arts, Artifices, and Manufactures; some of these as beneficial to them, or soon may be so, as our famous and great Staple trade is, at this day, to *England*, *comparatis comparandis*. Briefly, the Summer Sun ariseth more early, and shines as bright on *St. Andrews*, as on the *Roman Capitol*; and the *Vatican* is not so near to *Uranoburg*, as is *Edinburg*. And their flowry Philologers and Learned *Boetii* *, *Buchanans*, *Barcleys*, and hundreds more, never resigned their verdant laurels to *Politians*, *Bembo's*, or other Cis-Alpines. Nor do they shrink from assisting the Modern Restauration of solid, real and operative Philosophy. To come close to our Busenis, this I told Sir *R. M.* I durst undertake, that when *Edinburg* and their chief Towns and Universities shall plant Kitchen-gardens, as we do now in *England*, they shall receive their grateful reward the first year, and bear the charges of their Nurseries abundantly; and so hold on; and, within seven years, secure their posterity of the benefit, and delight themselves with the fruit of their pleasing labour. And thus one man may drive on the wheel, which a thousand hands cannot stop, when it is running on, and employ thousands of poor, at good worth.

* *Hector Boëtius*
highly valued by
Erasmus.

10. Now for fertilizing Rocks, I made bold to repeat it often, That within a days journey of the heart of *England*, I could shew three Gardens, the best that I have seen for flowry beauties, *English* evergreens, and fallads, all the Winter long; all these on a hard rock, in most places but one foot deep under earth; in some two, in few places three foot deep; very lofty hills close on the South-side, the declivity of the Gardens due North; and the rock perfectly bare next to the Walls on the North-side. And I saw rich Hoppyards in the same case, but in deeper ground, next to the garden, on the south-side of the garden: And these Northern Hop-yards escaped many blasts, which seized on the Hop-yards on the South-side of the Hill. On the steep ascent, on the North-side of one of these rocky hills, where no plough could come, I saw a Gentleman ploughing up the shallow turf with a hand-plough for Flaxe; and I saw good flaxe grow there, to the largeness of a village-field. His hand-plough had a stem of Ash or Sally about seven foot long, and a plate on one side neer the end, to turn the turf; a coulter to be let out shorter or longer, to cut the turfe 4, 5, or more inches deep, as the land affords it; and a small iron-wheel: This hand-plough, the Master and his man, by turns, drove before them with a walking spade; leathern aprons before them, to save their cloaths. For the causes of this hardy fertility, *viderint Philosophi*. I am sure of the truth of what I write: And I am willing to apprehend, that, if in *Scotland* they did, in fit places, sow the best Flax seed of *Flanders*, as many here do, they would make good Holland-linnen, Laune and Cambrick, as now they do Scotch-cloth.

11. It is no hard task to shovel down the shallow and mossy turf, from the deepest declivities of rocks, into places where it may have some receptacle or stay; and there to impregnate it with the spade and compost, for Gardens, or Vineyards. And there the *Tenth part of an acre in Gardening may yield more profit, than ten acres of ordinary tillage in a Corn field*. Of this computation I can make large proofs, both in Countrey-villages, and at great distance from any market-Town. I am so much a stranger to *Scotland*, that I cannot say, whether Saffron, Licorice, Hops, Madder, Oade, or what other rich commodities, do prosper there; but this I know, that our *English Saffron and Licorice* do far ex-

cell all the forreign, which our Druggists do sell us from the South: And since Vines and Mulberries have travailed from the remotest East, through all the hottest Countreys, and have abundantly enriched our next borderers, and have received acceptable hospitality, as far as they have been tried in this our Island: We have encouragement enough to adventure the cheap and easie Trial. Some of my correspondent, tried the Mulberry and Silkworm as far in the North as *Huntingtonshire* and *Cheshire*; and Sir *James Craig* tried them in the moistest place of *Ireland*, in the County of *Caran* in *Ulster*; and all boasted their success, *An.* 1651, 1652, 53, 54, 55. Wherever Mulberries grow, I am apt to expect, that the worms will live, and spin, and furnish the *Silken Trade*.

12. Lastly, to obtain favour, or pardon, and some credit for what hath been hitherto alledged, and withall to encourage bold adventures in Horticulture and Agriculture, and to suggest noble arguments for sublimer, deeper, and more Philosophical Disquisitions, to those Excellent Persons, whose business, glory, and happiness it is, *Rerum cognoscere causas*; I shall only transcribe the Learned *Laurembergs* Collections, *Horticulturæ* l. i. c. 13. Sect. 5. *Memoratu dignum est, quod de Novâ Zembla & Gronlandiâ narrant ij, qui viderunt.* Nova Zembla sub lat. 76. Sept. sterilis undique est, nec gramine, aut frondibus, nec animalibus benignis hospitium præbens: Gronlandia verò multo quàm ista borealior, pabuli graminisque proventus alit uberrimum. In hac pecorum & lactariorum tanta ubertas, ut etiam ingentes acervos butyri & caseorum componant incolæ, eosque vanum exponant eò navigantibus. Tam benignus & felix est hujus regionis genius, ut ne quidem ab Hybernis nivium & frigorum injuriis graminis vigorem & virorem patiatur extinguì, (unde primum Insulæ nomen:) ubi è contra, in Novâ Zemblâ mortua sunt omnia.

13. Non est quod obtendat quisquam, ab arido, pumicoso, & saxoso solo Novæ Zemblæ, nihilo pius frugum aut graminis expectandum, quàm à cautibus Suecicis. Groenlandiæ autem solum pingue, & fecundum, nihil mirum si feliciter quæque producat. At sciat ille, ne in fertilissima quidem Germania prata ac pascua, sub hyberno gelu nivibusque virorem suum illasum servare, pecorique sufficiens præbere pabulum; quod tamen non denegatum Groenlandiæ, in extremo mundi oardine delitescenti.

14. Deinde

14. *Deinde, si ineptam, & infelicem* Novæ Zemblæ terram spectes, & hanc tantopere ungeas, ei tam similis est Terzera insula, una ex septem Azoribus, quàm ovum ovo, aut lac lacti. Totius hujus Insulæ Terzeræ regio montosa est, cantibus præruptis deformata, dura, nec ulli: vel ferro vel chalybi cedens; vera congeries ac compages cantium, petrarum, saxorum. Furares, te videre innumeros adamantes, spectata loci duritie, acumine, & inæqualitate, ut etiam ne calcetis quidem pedibus sine periculo humus calcari possit. Et tamen totus hic monstruosus tractus (testis est Hugo Linscot. in Itiner.) tam ferax est vini, tam densè consitus vineis, ut æstate ne latus quidem digitus de solo ipso oculis notari possit. Ipsæ vitium radices intimè infixæ sunt mediis cantibus, ut miraculi simile videatur, vel uvam istic locorum nasci. Quin, quod magis mirère, loca glebis pinguisimis instructa, nullâ industriâ aut labore induci possunt, ut vel racemum unum ferre, vitibusque plantandis se submittere velint. Nihil huc ad fertilitatem impedimenti confert adamantina telluris durities, nihil commodi pinguis ejusdem constitutio: Quippè solo natura subest, Virg. Georg. 2. v. 49.

15. *Poterit & aliud documentum dari ex* Jos. à Costa, Hist. Ind. Occid. qui refert, in Yea & Villacuri, ⁱⁿ Peru Provinciis, vineas felicissimè crescere, quæ tamen nec pluviis ullis humectantur; (eas enim isti loco calum denegat,) neque hominum operâ unquam irrigantur, positiæ interim spongiosis, arenosis, & siccis locis; nihilominus incredibilem vinorum vim suppeditantes quotannis, quale beneficium à locis multò amenioribus, in eadem calî inclinatione, frustra expectatur.

16. *Itaque, quod demonstrandum proposueram, (saith he,) prædita est* quæque Telluris portio peculiari virtute, & successu producendi sata, qualis aliis locis, felicius fortè positis, à Deo & Natura neutiquam fuit indulta.

17. This was the information, which the inquisitive Dr. Laubenberg published Rostochi, Anno 1631. Perhaps the large expressions concerning Greenland and Nova Zembla must be limited to some known parts of both. But 'tis so certain, that some rocks are barren, and some pregnant, that we have good proof of some Rocks almost bare, which bear trees, and stony Vegetables trimly adorn'd with crystalline or glistering beauties, beyond the imitation of Art. And I have drawn a paper, in which I can shew

shew you, from the remoter antiquities, as far as the learnedest *Greeks* and *Romans* could reach, that the hills and mountains, and such flinty precipices, and such light land, as was worst for tillage, and pasture, was best for Vineyards, the steep sides easily pared into the Trenches, for a constant supply; and that the Wine from the Hills, and from the Mountains, was ever esteemed the richest. And *Milford haven* was once famous for plenty of rich Wine from the Mountains of *Wales*, and may be so again hereafter, if we go on, as we begin to do; and 'tis as cheap to try the Vines of *Smyrna*, and *Greece*, of the *Canaries*, of *Montefiasco*, the *Falernian* and *Chian*, as any vulgar Vine; but for Vines in our Northern climates we should choose the Southern declivity, and make a trench to carry off the rain above, before the stream falls into the Trenches of Vines. 'Tis as well the Honour as the Wealth of a people to plant and till their land with the richest and most useful commodities it will bear; and where nature is difficult, there to surmount it with Art, and Industry. And 'tis better to improve our own Countrey, than to conquer another. And a little Farm well tilled is better than a Mannor of large waste: *Laudato ingentia rura, Exiguum colito*, said *Columella* after *Virgil*. 'Tis not easie to number, how many wide Tracts of waste land in *England* and *Wales* have been reduced by artificial culture to be the richest land, since the reign of Queen *Elizabeth*.

18. Sir, You will excuse this prolixity, since we are more neerly concerned to search out the causes of Fertility, and to find the best remedies against Sterility, than to detect many minute and curious rarities, and some of those, which we call *Occult Qualities*. But I doubt, I have taken too much pains, and have given you too much trouble in proving, that warming steams do perpetually ascend from some quick Springs, and from some Tracts of land, since 'tis so vulgarly observed, that when the snow falls, and lies long on the brows of small hills, not worthy the name of hills, within a mile round about us, it very seldome snowes in our Villages but melts in the falling, or falls in a few large flakes, which are also dissolved as soon as they touch the Earth, or make no long stay there.

19. And

19. And yet I would gladly bestow more pains to find out all the Arts requisite to determine the nature of all subterraneous streams : This is like to be all the means we have, to search out the nature and variety of all those materials, which stuff up this Terraqueous Globe, 7000 miles in Diameter. For, by our deepest mines on land, and by all the gulfs and whirl-pools in the Seas, we have not *ab origine* to this day, entered deeper through the Mineral and Rocky hoops, ribbs, and crusts of the earth, as I think, than two or three miles from the plane ; which in comparision of 7000 miles is less than the shell and *cutis* of an Egg compared with the liquors and substance therein contained.

Sir, At next sitting down to scribble, God willing, I intend to give you some Experimental Demonstrations of the frequent and almost perpetual changes of the Surface of the whole Globe, or Mass of Earth, to a greater depth, than many are willing to imagine ; as appendant to this loos draught, and of importance in Agriculture, and affording fresh enquiries, and a considerable task for future Geographers. But you must expect no other language, or composure, than what comes first to a running pen, and agrees with rusticities ; for which I have more affections, than spare minutes to offer to you.

Your humble servant

J. Beale.

Mr. Flamsteed